

RTCA Special Committee 186, Working Group 3

ADS-B 1090 MOPS, Revision A

Meeting #4

**TCAS RA and Proposed Changes to Section 3
Based on revisions made to 1090-WP-3-04
Resulting from discussions during Meeting #3**

Presented by Greg Kuehl, UPS Airlines

SUMMARY
The proposed revision to 2.2.3.2.7.3.3.1, Table 2-54 is presented herein, based on discussions of the topic at the Melbourne and Phoenix meetings. Since DO-260 is a published document, the possibility exists that the existing bit allocation has been implemented. (The W-G members have no knowledge of any implementation.) Ron Jones suggested that the 0-4 encoding of bits 9-12 be designated as “Reserved” and 4 new bits be assigned. (The reserved bits may be reclaimed at a later revision.) The “Unknown” possibility was added to the CDTI status to indicate that CDTI might not be installed. (TCAS installed/not installed status will always be known to transponder systems. TCAS not installed is the same as TCAS inoperative.) A corresponding change to Section 3.0 Installed Equipment Performance, proposed revision to 3.5.5 follows, based on discussions during Meeting #3.

Proposed revision to 2.2.3.2.7.3.3.1, Table 2-54 presented below, based on discussion of the topic at the Melbourne meeting. Since the MOPS is a published document, the possibility exists that the existing bit allocation has been implemented. (The W-G members have no knowledge of any implementation.) Ron Jones suggested that the 0-4 encoding of bits 9-12 be designated as “Reserved” and 4 new bits be assigned. (The reserved bits may be reclaimed at a later revision.) The “Unknown” possibility has been added to the CDTI status to indicate that CDTI might not be installed. (TCAS installed/not installed status will always be known to transponder systems. TCAS not installed is the same as TCAS inoperative.) A corresponding change to Section 3.0 Installed Equipment Performance, proposed revision to 3.5.5 follows. [I agreed to revise the note about Non-transponder devices with pilot-selectable codes using the same ICAO address as the Mode-S transponder if both are operating. Since we agreed that a non-transponder device would not be installed with a Mode-S transponder, the note has been revised to require that the transponder default to the assigned ICAO address when the anonymous mode is not selected.](#)

2.2.3.2.7.3.3.1 “CC_4” Subfield in Aircraft Operational Status Message

The “CC_4” subfield is a 4-bit (“ME” bits 9 through 12, Message bits 41 through 44) field used to indicate En Route Operational Capabilities of the ADS-B transmitting system to other aircraft as defined by the following encoding shown in Table 2-54.

Table 2-54: “CC_4” Encoding (En Route Operational Capabilities)

CC_4 CODING		MEANING
Bit 9,10	Bit 11,12	
0 0	0 0	<i>Reserved</i>
	0 1	<u>Reserved</u>
	1 0	<i>Reserved</i>
	1 1	<u>Reserved</u>
0 1	0 0	<i>TCAS Not Operational; CDTI Not Operational or Unknown</i>
	0 1	<i>TCAS Not Operational; CDTI Operational</i>
	1 0	<i>TCAS Operational; CDTI Not Operational or Unknown</i>
	1 1	<i>TCAS Operational; CDTI Operational</i>
1 0	0 0	<i>TBD</i>
	0 1	<i>TBD</i>
	1 0	<i>TBD</i>
	1 1	<i>TBD</i>
1 1	0 0	<i>TBD</i>
	0 1	<i>TBD</i>
	1 0	<i>TBD</i>
	1 1	<i>TBD</i>

Note: In Table 2-54 “TCAS Operational” is meant to represent TCAS II (ACAS) operating in TA/RA mode.

Draft revision to section 3.5.2 Variable Data, to accommodate on-condition message data

3.5.2 Variable Data

3.5.2.1 Crew Entry Data

Controls used by the pilot/crew for data entry (e.g. flight number, call sign, emergency status) shall correctly perform their intended functions.

Note: Where regulations permit variation of the 24 bit Mode-S and/or ADS-B address, ~~an ADS-B and a Mode-S~~ transponder shall ~~default to the assigned~~ use the same ICAO address ~~when the anonymous mode is not selected, whenever both are operating.~~

~~3.5.2.1~~ 3.5.2.2 System Monitors ~~for Operational Status~~

If the on-board ADS-B function receives data from other on-board systems, that interface shall include validity indications for the system(s) or the individual data elements. (e.g. valid discrete, sign/status matrix) During the time that a failure or invalid state is indicated, the ADS-B system shall remove the associated data from messages or displays, and/or indicate to the crew and/or receiving systems that the associated ADS-B data is invalid or the associated application(s) or function(s) is unavailable.

Note: Where the on-board source system provides a failure indication to the crew, a redundant ADS-B indication of the system failure is not required.

3.5.3 On-Condition Data ~~Event Driven Data~~

3.5.3.1 General

~~If the ADS-B supported applications include on-condition messages, appropriate interface connections shall be provided to reliably indicate the conditions comprising the event, and control each supported message.~~

ADS-B is required to send specific messages indicating that an “event” has occurred or is occurring (e.g. Low Fuel, Engine Out). An “event” is defined by a set of conditions under which the message is to be sent. The ADS-B function must be provided with adequate information or triggers to recognize that the aircraft has met the conditions for a specific event message. Conditions might require the presence of some conditions and require the absence of others. It is the responsibility of the installer to insure that systems or sensors used to trigger event driven messages, are chosen to provide reliable indications of the condition(s) to be monitored in determining the occurrence of an “event”.

~~3.5.3.1~~ General

~~If the ADS-B applications include event driven messages, appropriate interface connections shall be provided to reliably indicate the conditions comprising the “event” and trigger each supported message.~~

3.5.3.2 ACAS Interface

If a TCAS/ACAS system is installed on the airplane, appropriate connection shall be made to the ADS-B system to support transmission of “event driven” messages (ref. 2.2.3.2.7: Event Driven Message Type Code **TBD**) as follows:

- a. ACAS Resolution Advisory (R/A) event message should be sent as soon as practical after the R/A is issued by the ACAS system. The R/A condition message should be repeated at the specified interval until the ACAS system removes the R/A.
- b. If the ACAS R/A is accompanied by a cross-link coordination, the ADS-B ACAS R/A message shall include the “sense” (i.e. “don’t climb/don’t descend”) of the R/A maneuver.

3.5.4 Class Code (basic)

[no change]

3.5.5 Capability Class Data

Capability class data include en route, terminal area, approach and landing, surface operations capability information supplied by installed applications. Capability class data must respond to changes in the availability of operational mode data (ref. 2.2.5.1.35 – 2.2.5.1.42).

3.5.5.1 ACAS/TCAS Operational Status

If ACAS/TCAS is installed, a valid discrete, or other appropriate data, shall be supplied to the ADS-B system such that the “Class Capability (CC)_4” subfield, bit 11 in the Aircraft Operations Status message, accurately indicates the operational status of the on-board ACAS/TCAS system. (Ref. Table 2-54)

3.5.5.2 CDTI Operational Status

If a Cockpit Display of Traffic Information (CDTI) is installed, a valid discrete, or other appropriate data, shall be supplied to the ADS-B system such that the “Class Capability (CC)_4” subfield, bit 12 in the Aircraft Operations Status message, accurately indicates the operational status of the on-board CDTI. (Ref. Table 2-54)